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CLAIMS

[Claim(s)]

[Claim 1] An insulating layer on the base material which carried out the laminating one by one between the insulating layer between the first passes, an etching stopper layer, and the second layer (A) In the resist pattern formation ingredient which comes to prepare the spreading layer of the chemistry magnification mold positive-resist constituent containing the compound which generates an acid by the exposure of the polyhydroxy styrene and the (B) radiation with which a part of hydrogen atom [at least] of a hydroxyl group was permuted by the acid dissociation nature dissolution control radical (A) Resist pattern formation ingredient characterized by the survival rate of the acid dissociation nature dissolution control radical after the dissociation test by the hydrochloric acid using 40% or less of thing as a component.

[Claim 2] (A) The resist pattern formation ingredient according to claim 1 whose acid dissociation nature dissolution control radical in a component is a low-grade alkoxyalkyl group.

[Claim 3] (A) The resist pattern formation ingredient according to claim 1 or 2 which is polyhydroxy styrene which a component becomes from the hydroxystyrene unit by which some [at least] hydrogen atoms of a hydroxystyrene (a1) unit and its (a2) hydroxyl group were permuted by the low-grade alkoxyalkyl group.

[Claim 4] (B) The resist pattern formation ingredient according to claim 1 to 3 whose components are at least one sort of acid generators chosen from bis-alkyl sulfonyl diazomethanes.

[Claim 5] (B) The resist pattern formation ingredient according to claim 4 whose components are bis(isopropyl sulfonyl) diazomethane, bis(tert-butyl sulfonyl) diazomethanes, or such mixture.

[Claim 6] (B) The resist pattern formation ingredient according to claim 4 or 5 whose component is the acid generator which comes to blend the onium salt of 2 - 5 mass % to the above-mentioned diazomethane further.

[Claim 7] The resist pattern formation ingredient according to claim 1 to 6 with which a chemistry magnification mold positive-resist constituent contains the third class fatty amine.

[Claim 8] The resist pattern formation ingredient according to claim 1 to 7 with which an insulating layer or its both consist of with a dielectric constant of 3.0 or less silicon oxide between the insulating layer between the first passes, or the second layer.

[Claim 9] The resist pattern formation ingredient according to claim 1 to 8 with which an etching stopper layer consists of silicon nitride, silicon carbide, or tantalum nitride.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to a suitable resist pattern formation ingredient to use, in case a wiring gutter is formed after forming a beer hall by the beer first's dual DAMASHIN method, a resist pattern formation ingredient suitable as an object for semiconductor device manufacture, and, if it says in more detail.

[0002]

[Description of the Prior Art] In recent years, integration of a semiconductor device is in the steadily increasing situation that the mass production of LSI near design rule 0.20micrometer is already started, and mass production of LSI near design rule 0.15micrometer is also realized in the near future.

[0003] By the way, a chemistry magnification mold positive-resist constituent is proposed, and this is shifting to use of this thing gradually from a place excellent in definition or sensibility recently compared with the positive resist of the non-chemistry magnification mold of the former [constituent] are using novolak resin as base material resin, and using a naphthoquinonediazide sulfonate as a sensitization agent.

[0004] And the thing as such a chemistry magnification mold positive-resist constituent, were using the copolymer of p-(1-ethoxy ethoxy) styrene] and p-hydroxystyrene, and using a sulfonyl diazomethane system acid generator like bis (cyclohexyl sulfonyl) diazomethane as an acid generator as base material resin is known, for example (JP,5-249682,A).

[0005] Although this makes the resist pattern of high definition form by combining the acetal radical dissociated from an acid comparatively weak as a dissolution control radical, and the sulfonyl diazomethane system compound which generates a comparatively weak acid When the base material resin which has only an acetal radical is used and there is an inclination for the once formed resist pattern to become thin transiently, it is points, such as thermal resistance and a substrate dependency, and since it is not what can not necessarily be satisfied, utilization is difficult.

[0006] In order to conquer such a fault, in addition to an acetal radical, the chemistry magnification mold positive-resist constituent using a sulfonyl diazomethane system acid generator is proposed in the copolymer and the mixed resin which made the acid dissociation nature machine which cannot dissociate easily in weak acid like a tert-butoxycarbonyl radical, tert-butyl, and a tetrahydropyranyl group, and is dissociated with strong acid live together, and this is in use current.

[0007] In another side, with detailed-izing of a semiconductor device, the manufacture process is moving from aluminum wiring which used the old reactive-ion-etching (RIE) technique with aluminum-Cu wiring using a DAMASHIN technique, or Cu wiring HE, and it is expected in a generation's semi-conductor manufacture process one after another the next generation and that a DAMASHIN technique becomes the leading role.

[0008] by the way, on this DAMASHIN technique two kinds, the trench first method which forms a wiring gutter previously, and the beer first method which forms beer previously, -- existing -- although -- (the volume May 30, Heisei 10, incorporated company rear rise company issue, and for deep flooding Katsuro, the "newest expansion of Cu wiring technique", the 202-205th page) In case the wiring gutter is formed by the latter beer first's dual DAMASHIN method, when a resist pattern is formed according to a lithography process using the above mentioned chemistry magnification mold positive-resist constituent, the upper part of beer has the fault of producing the resist remainder of poor development.

[0009]

[Problem(s) to be Solved by the Invention] This invention can give the resist pattern of high definition which can be equivalent to the detailed pattern demanded when manufacturing a semiconductor device by such the beer first's dual DAMASHIN method, and is made for the purpose of offering the resist pattern formation ingredient which moreover does not produce the resist remainder.

[0010]

[Means for Solving the Problem] The result of having repeated research variously about the resist pattern formation ingredient which this invention persons use for the beer first's dual DAMASHIN method, (A) by the exposure of the polyhydroxy styrene and the (B) radiation with which a part of hydrogen atom [at least] of a hydroxyl group was permuted by the acid dissociation nature dissolution control radical By using the polyhydroxy styrene containing the acid definition dissolution control radical which shows a low survival rate by the predetermined dissociation test as a (A) component of the chemistry magnification mold positive-resist constituent containing the compound which generates an acid Based on a header and this knowledge, it came to make this invention for having high definition and high sensitivity and few resist pattern formation ingredients of the resist remainder being obtained.

[0011] This invention an insulating layer namely, on the base material which carried out the laminating one by one between the insulating layer between the first passes, an etching stopper layer, and the second layer (A) In the resist pattern formation ingredient which comes to prepare the spreading layer of the chemistry magnification mold positive-resist constituent containing the compound which generates an acid by the exposure of the polyhydroxy styrene and the (B) radiation with which a part of hydrogen atom [at least] of a hydroxyl group was permuted by the acid dissociation nature dissolution control radical (A) The resist pattern formation ingredient characterized by the survival rate of the acid dissociation nature dissolution control radical after the dissociation test by the hydrochloric acid using 40% or less of thing as a component is offered.

[0012] The dissociation test by the aforementioned hydrochloric acid dissolves the (A) component in an organic solvent, adds the hydrochloric acid in the amount used as this resin solution and a uniform solution, stirs it for 10 minutes in 10-30 degrees C, for example, a room temperature, and is performed by making an acid dissociation nature dissolution control radical dissociate. The thing of 10 mass % concentration is used as a hydrochloric acid in this case. Moreover, the above-mentioned range is used as processing temperature. Moreover, as an organic solvent which dissolves the (A) component, propylene-glycol-monomethyl-ether acetate is desirable, and the concentration of the (A) component is 10 mass %.

[0013]

[Embodiment of the Invention] The base material in this invention consists of insulating layers between the insulating layer between the first passes which carried out the laminating to the substrate on it, an etching stopper layer, and the second layer. And as a substrate, the substrate usually commonly used in the case of semiconductor device manufacture, for example, a silicon wafer, is used. Moreover, as an insulating layer, the insulator layer which consists of a low dielectric constant ingredient, i.e., a with a dielectric constant of 3.0 or less ingredient, is used between the insulating layer between the first passes, and the second layer. In a DAMASHIN technique, this thing is a layer made indispensable regardless of any of single DAMASHIN and dual DAMASHIN, for example, is formed by the CVD method, organic or the inorganic SOG method, the rotation applying method of an organic polymer, etc.

[0014] Silicon oxide [according to a plasma-CVD method as an example of such an insulating layer "Black Diamond" (Applied Materials make),], such as "Coral" (product made from Novellus), the hydrogen content silicon oxide which has the Si-H radical which the silicon in silicon oxide combined with the hydrogen atom, The polyimide film, the benz-cyclo-butene polymer film, the alkyl group content silicon oxide that the silicon atom in silicon oxide combined with an alkyl group like a methyl group, Fluorine content silicon oxide, the fluorine basis resin film, the quality of mixture of a silicon porous material and fluorine basis resin, The arylene ether system polymer film, the mixture film of fluorine basis resin and siloxane basis resin, the poly quinoline basis resin film, the poly quinoxaline basis resin film, the fullerene film, etc. can be mentioned.

[0015] Next, when performing highly precise etching of a trench, i.e., a wiring gutter, or beer, the etching stopper layer prepared between the insulating layer between the first passes and the insulating layer between the second layer is a layer prepared in the bottom of a trench or beer, and is for preventing too much etching. There are silicon nitride (SiN), silicon carbide (SiC), and tantalum nitride (TaN), for example, and this can be made to form with a CVD method as such a layer.

[0016] As thickness of these layers, 1000-3000A of insulating layers is usually the range of 2000-3000A, and the range

whose etching stopper layer is 500-1000Å preferably between for a start and the second layer.

[0017] In addition, the base material in this invention which consists of insulating layers may form preferably hard surface mask blank layers, such as carbonation silicon (SiOC) and silicon nitride (SiN), by 500-1000Å 500-1200Å of thickness on an insulating layer between the second layer further according to an application between the insulating layer between the first passes which carried out the laminating to the above-mentioned substrate on it, an etching stopper layer, and the second layer.

[0018] Moreover, since the etching stopper layer in the above-mentioned base material has a possibility of raising the dielectric constant of the first and the second interlayer insulation film, the two-layer structure of the above-mentioned hard surface mask blank layer preferably formed 3000-7000Å of thickness a 4000-6000Å layer insulation membrane layer and on this without minding such an etching stopper layer is sufficient as it.

[0019] Although the spreading layer of a chemistry magnification mold positive resist constituent be prepare on the insulating layer between the second layer of the base material in which the resist pattern formation ingredient of this invention have the above mentioned structure, this chemistry magnification mold positive resist constituent contain the compound which generate an acid by the exposure of the polyhydroxy styrene and the (B) radiation with which a part of hydrogen atom [at least] of the (A) hydroxyl group be permuted by the acid dissociation nature dissolution control radical.

[0020] The dissociation test according [on this invention and] to a hydrochloric acid as the above-mentioned (A) component, Namely, after the trial which adds the hydrochloric-acid 10 mass section of concentration 10 mass % to the propylene-glycol-monomethyl-ether acetate solution 100 mass section of 10 mass % of the (A) component held at 10-30 degrees C of solution temperature, and is stirred for 10 minutes It is required for the survival rate of an acid dissociation nature dissolution control radical to use the polyhydroxy styrene by which a part of hydrogen atom [at least] of a hydroxyl group was permuted by 40% or less of acid dissociation nature dissolution control radical.

[0021] As mentioned above, in order to prevent the resist remainder on beer, according to this invention persons' knowledge, it is necessary about a positive-resist constituent to use the acid dissociation nature dissolution control radical which shows a low survival rate by the above-mentioned dissociation test but, and it means that this must use what does not contain the acid dissociation nature dissolution control radical which will be hard to dissociate if it is not strong acid, for example, the dissolution control radical which is hard to dissociate rather than a low-grade alkoxyalkyl group.

[0022] As the Prior art explained, by the way, about an acid dissociation nature dissolution control radical like [until now] an ethoxyethyl radical, and the so-called acetal type of chemistry magnification mold positive-resist constituent To the alkoxyalkyl group which also dissociates a comparatively weak acid as a basis resinous principle When it was not strong acid, usually polyhydroxy styrene with the acid dissociation nature dissolution control radical which combined the third class alkoxy carbonyl group which is hard to dissociate, the third class alkyl group, and the cyclic ether radical was used.

[0023] However, in this invention, if it is not the above strong acid, the basis resinous principle which eliminated existence of the acid dissociation nature dissolution control radical which is hard to dissociate will be used. This is because it will become easy to generate the resist remainder on beer if it is not such strong acid, and the acid dissociation nature dissolution control radical which is hard to dissociate is equivalent to the radical on which the survival rate of the acid dissociation nature dissolution control radical after the dissociation test by the hydrochloric acid exceeds 40% and such a radical exists in a base material resinous principle.

[0024] As such a basis resinous principle, it is polyhydroxy styrene which consists of a hydroxystyrene (a1) unit and a unit by which some [at least] hydrogen atoms of the hydroxyl group of hydroxystyrene (a2) were permuted by the acid dissociation nature dissolution control radical, and what is combination with the radical to which the above-mentioned acid dissociation nature dissolution control radical tends to carry out acid dissociation only of the low-grade alkoxyalkyl group to a low-grade alkoxyalkyl group rather than this can be mentioned.

[0025] (a1) A unit is a unit which gives alkali fusibility and the adhesion to a substrate, and is a unit to which the ethylene nature double bond of hydroxystyrene or hydroxy alpha methyl styrene cleaves, and is guided. Although any like p-are sufficient as the location of hydroxyl, it is easy to receive, and since at least o- is a low price, at least m- of p- is the most desirable [a location /-].

[0026] At least, namely, a unit (a2) moreover, by being the unit which permuted the hydrogen atom of all hydroxyl groups or some hydroxyl groups by the acid dissociation nature dissolution control radical, and having this unit [the

hydroxyl group of the above-mentioned hydroxystyrene unit] Since an acid dissociation nature dissolution control radical ****s and it changes with operations of the acid generated by the exposure of a radiation to a phenolic hydroxyl group, it is made to change to alkali fusibility before exposure, in the exposure section, after exposing the (A) component which is alkali insolubility.

[0027] As 40% or less of an acid dissociation nature dissolution control radical, a low-grade alkoxyalkyl group has a desirable survival rate after the dissociation test by the hydrochloric acid in the (A) component in this invention, and a 1-ethoxy-1-ethyl group, a 1-isopropoxy-1-ethyl group, a 1-methoxy-1-methylethyl radical, a 1-methoxy-1-propyl group, a 1-n-butoxyethoxy radical, etc. are mentioned as an example of such a radical.

[0028] Furthermore, the (A) component of this invention needs not to include the dissolution control radical which is hard to dissociate from this low-grade alkoxyalkyl group. With such a dissolution control radical, the third class alkyloxy carbonyl group, the third class alkyl group or a cyclic ether radical, for example, a tert-butoxycarbonyloxy radical, tert-butyl, a tetrahydropyranyl group, etc. are mentioned.

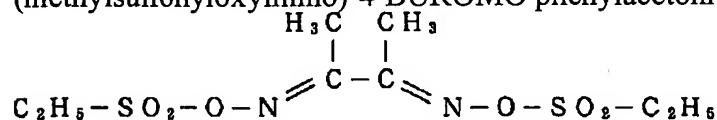
[0029] Unless such a dissolution control radical that is hard to dissociate is included (A) Although the component may include the unit with acid dissociation nature dissolution control radicals other than the unit by which some [at least] hydrogen atoms of the hydroxyl group of a hydroxystyrene (a1) unit and (a2) hydroxystyrene were permuted by the acid dissociation nature dissolution control radical You may be the resin which, of course, has only a low-grade alkoxyalkyl group as an acid dissociation nature dissolution control radical, i.e., the polymer with which a part of hydrogen atom of the hydroxyl group of polyhydroxy styrene was permuted only by the low-grade alkoxyalkyl group. Moreover, you may be the mixture of two or more sorts of polyhydroxy styrene with which some [at least] hydrogen atoms of a hydroxyl group were permuted by different low-grade alkoxyalkyl group.

[0030] And the polyhydroxy styrene by which 10 - 60% of the hydrogen atom of the hydroxyl group of the polyhydroxy styrene of the range of degrees of dispersion 1.0-6.0 was permuted especially with the mass mean molecular weights 3000-30000 from excelling in definition and a resist pattern configuration by the 1-ethoxy-1-ethyl group or the 1-isopropoxy-1-ethyl group is desirable. for attaining skirt length prevention of a resist pattern and high definition especially -- the mass ratio 1:9 of two sorts of these polyhydroxy styrene thru/or 9:1 -- the mixture of 5:5 thru/or 1:9 is preferably desirable. As for this (A) component, the solubility to alkali increases by the exposure of a radiation under coexistence with an acid generator.

[0031] Next, as a compound which generates an acid by exposure, the (B) component, i.e., the radiation, used together with the aforementioned (A) component with the chemistry magnification mold positive-resist constituent in this invention, an onium salt system acid generator, an oxime sulfonate system acid generator, a sulfonyl diazomethane system acid generator, etc. can be used.

[0032] As an onium salt system acid generator, trifluoromethane sulfonate or nonafluorobutane sulfonate of bis(4-tert buthylphenyl) iodonium, Trifluoromethane sulfonate or nonafluorobutane sulfonate of triphenylsulfonium, Trifluoromethane sulfonate or nonafluorobutane sulfonate of dimethyl monophenyl sulfonium, Trifluoromethane sulfonate or nonafluorobutane sulfonate of monomethyl diphenyl sulfonium, Trifluoromethane sulfonate or nonafluorobutane sulfonate of 4-tert butoxycarbonyl methyloxy FENIRUJIFENIRU sulfonium etc. is mentioned.

[0033] As an oxime sulfonate system acid generator, they are alpha-(methylsulfonyloxyimino)-phenylacetonitrile, alpha-(methylsulfonyloxyimino)-4-methoxyphenyl acetonitrile, alpha-(trifluoro methylsulfonyloxyimino)-4-methoxyphenyl acetonitrile, alpha-(propylsulfonyloxyimino)-4-methylphenyl acetonitrile, alpha-(methylsulfonyloxyimino)-4-BUROMO phenylacetonitrile, and [Formula 1].



**** is mentioned.

[0034] The following compound can be mentioned as a sulfonyl diazomethane system acid generator. Bis-alkyl sulfonyl diazomethane which has the alkyl group of the shape of a straight chain, such as bis(n-propyl sulfonyl) diazomethane, bis(isopropyl sulfonyl) diazomethane, bis(n-butyl sulfonyl) diazomethane, bis(isobutyl sulfonyl) diazomethane, and bis(tert-butyl sulfonyl) diazomethane, and the letter of branching.

[0035] These (B) components may be used independently and may be used combining two or more sorts. In these, the bis-alkyl sulfonyl diazomethane which has the alkyl group of the shape of a straight chain of carbon numbers 1-4 and

the letter of branching from points, such as transparency, reinforcement of a moderate acid, and alkali solubility, is desirable. Although the resist pattern of high definition is obtained and the resist remainder on beer is controlled especially, bis(isopropyl sulfonyl) diazomethane, bis(tert-butyl sulfonyl) diazomethanes, or such mixture are desirable. [0036] Moreover, when the onium salt of 2 - 5 mass % is blended to the above-mentioned screw alkyl sulfonyl diazomethane, since high definition can be attained more, it is desirable. As such onium salt, the trifluoromethane sulfonate or nonafluorobutane sulfonate of bis(4-tert buthylphenyl) iodonium is desirable.

[0037] the loadings of these (B) components -- the (A) component 100 mass section -- receiving -- 0.5 - 30 mass section -- it is preferably chosen in the range of 1 - 10 mass section. If pattern formation is not fully performed under in the 0.5 mass section and these loadings exceed 30 mass sections, a uniform solution will be hard to be obtained, and it becomes the cause that preservation stability falls.

[0038] In addition to the above mentioned (A) component and the above mentioned (B) component, further, it lengthens according to a request and places, and stability with the passage of time can be raised, or the organic amine which prevents excessive diffusion of an acid, and sensibility can be raised in the chemistry magnification mold positive-resist constituent used by this invention, and the organic carboxylic acid which disappears a substrate dependency, and an additive with the still better known surfactant for an antihalation agent and striae SHON prevention etc. can be blended with it.

[0039] As this organic amine, although the second class or the third class fatty amines, such as a trimethylamine, diethylamine, triethylamine, *l*-n propylamine, *l*-n propylamine, tripropylamine, diethanolamine, and triethanolamine, are used for example, the third class fatty amine especially like alkylamine and a thoria RUKANORU amine is desirable. These may be used independently, and two or more sorts may be combined and they may be used. These organic amines are usually used in the range of 0.01 - 5 mass % based on the (A) component.

[0040] Moreover, as an organic carboxylic acid, aromatic carboxylic acid, such as aliphatic carboxylic acid, such as an acetic acid, a citric acid, a succinic acid, a malonic acid, and a maleic acid, and a benzoic acid, a salicylic acid, is used, for example. These may be used independently, and two or more sorts may be combined and they may be used. These organic carboxylic acids are usually used in the range of 0.01 - 5 mass % based on the (A) component.

[0041] The above-mentioned chemistry magnification mold positive-resist constituent dissolves the addition component added by the (A) component, the (B) component, and request in an organic solvent, and is used as coating liquid. under the present circumstances, the thing which can dissolve both the above-mentioned components and can be used as a uniform solution as an organic solvent to be used -- it is -- ****ing -- the thing of the arbitration out of a thing conventionally well-known as a solvent of a chemistry magnification mold resist -- one sort -- or it can choose suitably and two or more sorts can be used.

[0042] As an example of such an organic solvent, an acetone, a methyl ethyl ketone, Ketones, such as a cyclohexanone, methyl isoamyl ketone, and 2-heptanone Ethylene glycol and ethylene glycol mono-acetate, a diethylene glycol, Diethylene-glycol mono-acetate, propylene glycol, and propylene glycol mono-acetate, The monomethyl ether of dipropylene glycol or dipropylene glycol mono-acetate, Polyhydric alcohol, such as the monoethyl ether, the monopropyl ether, the monobutyl ether, or the monophenyl ether, and the derivative of those, Ester, such as ring type ether like dioxane, methyl lactate, ethyl lactate, methyl acetate and ethyl acetate, butyl acetate, methyl pyruvate, pyruvic-acid ethyl, methoxy methyl propionate, and ethoxy ethyl propionate, can be mentioned.

[0043] The resist pattern formation ingredient of this invention can apply the coating liquid of the chemistry magnification mold positive-resist constituent prepared as mentioned above on the above mentioned base material, and can manufacture it by making a spreading layer with a thickness of 0.3-0.7 micrometers form.

[0044] The organic antireflection film aiming at the etching stopper layer of acid resisting from flattening of a base material or a base material and the beer lowest layer at the time of forming a trench by etching further etc. may be made to intervene in this invention between the spreading layers of a base material and a chemistry magnification mold positive-resist constituent. Such antireflection film applies the constituent for antireflection-film formation with which at least two of the hydrogen atom of the amino group dissolved an amino system cross linking agent and acid compounds, such as benzoguanamine, a melamine, a urea, etc. which were permuted by the methylol radical, the low-grade alkoxy methyl group, or its both, in the organic solvent on a base material, and it dries and it is formed by subsequently heating at 100-300 degrees C. With an acid compound, inorganic acids, such as a sulfuric acid, a sulfurous acid, and a thiosulfuric acid, an organic sulfonic acid, an organic sulfonate, the acid generator that generates an acid with an activity beam of light are mentioned.

[0045] Especially in this invention, the organic antireflection film formed from the constituent for organic antireflection film formation which adjusted the rate that low **** below the trimer of the above-mentioned amino system cross linking agent occupies, to below 15 mass % is desirable. The thickness of an antireflection film is 0.03-0.5 micrometers.

[0046] Like the case of the usual resist pattern formation ingredient, through the mask pattern of a request of a radiation, for example, KrF, or ArF excimer laser light, the resist pattern formation ingredient of this invention is irradiated, and is heated. Subsequently, the development of this is carried out using an alkali developer, for example, a 0.1 - 10 mass % tetramethylammonium hydroxide water solution. Thus, a pattern faithful to a mask pattern can be made to form. As a radiation in that case, radiations, such as F2 laser of short wavelength, EUV (extreme ultraviolet rays) and VUV (vacuum ultraviolet radiation), an electron ray, an X-ray, and soft X ray, can also be used from it other than a KrF excimer laser or an ArF excimer laser.

[0047]

[Example] Next, an example explains this invention to a detail further. In addition, many physical properties in each example are measured as follows.

[0048] The survival rate of a dissolution control radical : (1) Dissolve the predetermined polyhydroxy styrene 10 mass section in the propylene-glycol-monomethyl-ether acetate 90 mass section. After preparing the resin solution of 10 mass % concentration, add the hydrochloric-acid 10 mass section of 10 mass % concentration to this, and consider as a uniform solution, and in 23 degrees C, stir for 10 minutes, and a dissolution control radical is made to dissociate. By the 13 C-NMR method The substitutional rate of the dissolution control radical before and behind acid treatment was measured, and the survival rate was calculated by the degree type from the measured value.

[Equation 1]

$$\text{残存率 (\%)} = \frac{\text{酸処理後の置換率}}{\text{酸処理前の置換率}} \times 100$$

[0049] Sensibility : (2) Mind a mask so that a trench may be formed on beer at a resist pattern formation ingredient. Contraction projection aligner FPA-3000EX3 (canon company make) is used. After applying and exposing a dose 1 mJ/cm every 2, 110 degrees C and PEB for 60 seconds (POST EXPOSURE BAKE) are performed. When negatives are developed for 30 seconds in 23 degrees C, it rinses for 30 seconds and it dries using a 2.38 mass % tetramethylammonium hydroxide water solution, A resist pattern (0.25 micrometers or 0.18 micrometers) and a tooth-space pattern given in Table 1 measured in mJ/cm2 (the amount of energy) unit by making the exposure time used as 1:1 into sensibility.

[0050] (3) existence [of the resist remainder]: on beer -- what observe and is not [whether the resist remainder has generated on beer the resist pattern (given in Table 1 Rhine, and tooth-space 0.25micrometer, or 0.18 micrometers) obtained by the same actuation as the above (2) with the SEM (scanning electron microscope) photograph, and] -- some [O and] -- a certain thing -- ** -- abundant -- a certain thing was evaluated as x.

[0051] (4) Resolution : the marginal resolution of Rhine obtained by the same actuation as the above (2) and a tooth-space pattern was investigated.

[0052] By the plasma-CVD method, after making the 1st silicon oxide (dielectric constant 2.7) form on the example silicon wafer of reference, the base material which prepared the thin film (etching stopper layer) of SiN with the CVD method, and prepared the 2nd silicon oxide (dielectric constant 2.7) by the plasma-CVD method further at this SiN film top was prepared on this oxide film on. And the beer which penetrates the 1st silicon oxide, SiN film, and 2nd silicon oxide was formed in this base material.

[0053] The polyhydroxy styrene 100 mass section of the mass mean molecular weight 8,000 and a degree of dispersion 1.2 by which 35% of hydrogen atom of the existing hydroxyl group was permuted by the 1-isopropoxy-1-ethyl group as an example 1 (A) component (B) The bis(isopropyl sulfonyl) diazomethane 10 mass section is used as a component. These were dissolved in the tri-isopropanolamine 0.40 mass section and the propylene-glycol-monomethyl-ether acetate 500 mass section, with the membrane filter of 0.2 micrometers of apertures, it filtered and the coating liquid of a chemistry magnification mold positive-resist constituent was prepared. Next, the resist pattern formation ingredient was manufactured by making the resist film of 0.53 micrometers of thickness form by preparing an organic antireflection film (the TOKYO OHKA KOGYO CO., LTD. make, trade name "SWK-EX9") by 1100A of thickness on the base material with which the beer obtained in the example of reference was formed, using a spinner, applying

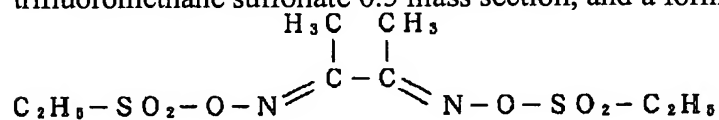
this coating liquid on this, and drying for 60 seconds on a 90-degree C hot plate. The physical properties of this thing are shown in Table 1.

[0054] The polyhydroxy styrene 100 mass section of the mass mean molecular weight 8,000 and a degree of dispersion 1.2 by which 35% of hydrogen atom of the existing hydroxyl group was permuted by the 1-ethoxy-1-ethyl group as an example 2 (A) component (B) The bis(isopropyl sulfonyl) diazomethane 15 mass section is used as a component. It dissolved in the tri-isopropanolamine 0.40 mass section and the propylene-glycol-monomethyl-ether acetate 500 mass section, these were filtered, coating liquid was prepared, and the resist pattern formation ingredient was manufactured completely like the example 1 using this. The physical properties of this thing are shown in Table 1.

[0055] As an example 3 (A) component The mass mean molecular weight 8,000 by which 35% of hydrogen atom of the existing hydroxyl group was permuted by the 1-ethoxy-1-ethyl group, the mass mean molecular weight 8 by which 35% of hydrogen atom of the polyhydroxy styrene 50 mass section of a degree of dispersion 1.2 and the existing hydroxyl group was permuted by the 1-isopropoxy-1-ethyl group, The mixture of 000 and the polyhydroxy styrene 50 mass section of a degree of dispersion 1.2 (B) The mixture of the bis(isopropyl sulfonyl) diazomethane 5 mass section and the bis(tert-butyl sulfonyl) diazomethane 10 mass section is used as a component. It dissolved in the tri-isopropanolamine 0.40 mass section and the propylene-glycol-monomethyl-ether acetate 500 mass section, these were filtered, coating liquid was prepared, and the resist pattern formation ingredient was manufactured completely like the example 1 using this. The physical properties of this thing are shown in Table 1.

[0056] As an example 4 (A) component The mass mean molecular weight 8,000 by which 35% of hydrogen atom of the existing hydroxyl group was permuted by the 1-ethoxy-1-ethyl group, the mass mean molecular weight 8 by which 35% of hydrogen atom of the polyhydroxy styrene 50 mass section of a degree of dispersion 1.2 and the existing hydroxyl group was permuted by the 1-isopropoxy-1-ethyl group, The mixture of 000 and the polyhydroxy styrene 50 mass section of a degree of dispersion 1.2 (B) The mixture of the bis(isopropyl sulfonyl) diazomethane 5 mass section, the bis(tert-butyl sulfonyl) diazomethane 10 mass section, and the bis(4-tert buthylphenyl) iodonium trifluoromethane sulfonate 0.5 mass section is used as a component. It dissolved in the tri-isopropanolamine 0.40 mass section and the propylene-glycol-monomethyl-ether acetate 500 mass section, these were filtered, coating liquid was prepared, and the resist pattern formation ingredient was manufactured completely like the example 1 using this. The physical properties of this thing are shown in Table 1.

[0057] As an example 5 (A) component The mass mean molecular weight 8,000 by which 35% of hydrogen atom of the existing hydroxyl group was permuted by the 1-ethoxy-1-ethyl group, the mass mean molecular weight 8 by which 35% of hydrogen atom of the polyhydroxy styrene 50 mass section of a degree of dispersion 1.2 and the existing hydroxyl group was permuted by the 1-isopropoxy-1-ethyl group, The mixture of 000 and the polyhydroxy styrene 50 mass section of a degree of dispersion 1.2 (B) -- as a component -- the bis(isopropyl sulfonyl) diazomethane 5 mass section, the bis(tert-butyl sulfonyl) diazomethane 10 mass section, the bis(4-tert buthylphenyl) iodonium trifluoromethane sulfonate 0.5 mass section, and a formula [** 2]



It came out, and using the mixture of the compound 0.5 mass section expressed, it dissolved in the tri-isopropanolamine 0.40 mass section and the propylene-glycol-monomethyl-ether acetate 500 mass section, these were filtered, coating liquid was prepared, and the resist pattern formation ingredient was manufactured completely like the example 1 using this. The physical properties of this thing are shown in Table 1.

[0058] As an example 1 (A) component of a comparison The mass average molecular weight 8 by which 35% of hydrogen atom of the existing hydroxyl group was permuted by the tert-butoxycarbonyl radical, Except having used the mixture of the polyhydroxy styrene 70 mass section of the mass mean molecular weight 8,000 by which 35% of hydrogen atom of 000, the polyhydroxy styrene 30 mass section of a degree of dispersion 1.2, and the existing hydroxyl group was permuted by the 1-isopropoxy-1-ethyl group, and a degree of dispersion 1.2 The resist pattern formation ingredient was completely manufactured like the example 1. The physical properties of this thing are shown in Table 1.

[0059] As an example 2 (A) component of a comparison The mass mean molecular weight 8,000 by which 30% of hydrogen atom of the existing hydroxyl group was permuted by tert-butyl, the mass mean molecular weight 8,000 by

which 35% of hydrogen atom of the polyhydroxy styrene 30 mass section of a degree of dispersion 1.2 and the existing hydroxyl group was permuted by the 1-isopropoxy-1-ethyl group, Except having used the mixture of the polyhydroxy styrene 70 mass section of a degree of dispersion 1.2, the resist pattern formation ingredient was completely manufactured like the example 1. The physical properties of this thing are shown in Table 1.

[0060] As an example 3 (A) component of a comparison The mass mean molecular weight 8,000 by which 35% of hydrogen atom of the existing hydroxyl group was permuted by the tetrahydropyranyl group, the mass mean molecular weight 8 by which 35% of hydrogen atom of the polyhydroxy styrene 20 mass section of a degree of dispersion 1.2 and the existing hydroxyl group was permuted by the 1-isopropoxy-1-ethyl group, The resist pattern formation ingredient was completely manufactured like the example 1 except having used the mixture of 000 and the polyhydroxy styrene 80 mass section of a degree of dispersion 1.2. The physical properties of this thing are shown in Table 1.

[0061] The resist pattern formation ingredient was completely manufactured like the example 1 except having used the polyhydroxy styrene 100 mass section of the mass mean molecular weight 8,000 and a degree of dispersion 1.2 by which 35% of hydrogen atom of the existing hydroxyl group was permuted by the tert-butoxycarbonyl radical as an example 4 (A) component of a comparison. The physical properties of this thing are shown in Table 1.

[0062] As an example 5 (A) component of a comparison The mass mean molecular weight 8,000 by which 35% of hydrogen atom of the existing hydroxyl group was permuted by the tetrahydropyranyl group, the mass mean molecular weight 8 by which 35% of hydrogen atom of the polyhydroxy styrene 50 mass section of a degree of dispersion 1.2 and the existing hydroxyl group was permuted by the 1-isopropoxy-1-ethyl group, The resist pattern formation ingredient was completely manufactured like the example 1 except having used the mixture of 000 and the polyhydroxy styrene 50 mass section of a degree of dispersion 1.2. The physical properties of this thing are shown in Table 1.

[0063]

[Table 1]

		溶解抑制基 の残存率(%)	感 度 (mJ/cm ²)	ビア上のレジスト 残りの有無	解 像 度 (μm)
実 施 例	1	29	42 (0.25 μm)	○	0.18
	2	29	45 (0.25 μm)	○	0.18
	3	29	42 (0.25 μm)	○	0.18
	4	29	39 (0.18 μm)	○	0.15
	5	29	35 (0.18 μm)	○	0.15
比 較 例	1	100	41 (0.25 μm)	△	0.18
	2	100	40 (0.25 μm)	×	0.18
	3	57	45 (0.25 μm)	△	0.18
	4	100	解像せず(0.25 μm)	評価不能	解像せず
	5	57	52 (0.25 μm)	×	0.20

[0064] In addition, as a survival rate of the dissolution control radical in this table, when the (A) component had two sorts of acid dissociation nature dissolution control radicals by mixed resin, only the one where that survival rate is higher was indicated.

[0065] As shown in this table, when the survival rate of an acid dissociation nature dissolution control radical uses 40% or less of thing as a (A) component, the resist remainder on beer becomes that there is nothing, but when other, the resist remainder is accepted even if there are some differences.

[0066]

[Effect of the Invention] According to this invention, the resist remainder produced in case a wiring gutter (trench) is formed by the beer first's dual DAMASHIN method after forming a beer hall is prevented, and the resist pattern formation ingredient which can form the resist pattern which excelled [high sensitivity] in resolution is offered.

[Translation done.]

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

CORRECTION OR AMENDMENT

[Kind of official gazette] Printing of amendment by the convention of 2 of Article 17 of Patent Law

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[Procedure amendment 1]

[Document to be Amended] Specification

[Item(s) to be Amended] 0004

[Method of Amendment] Modification

[Proposed Amendment]

[0004] And the thing as such a chemistry magnification mold positive-resist constituent, were using the copolymer of p-(1-ethoxy ethoxy) styrene and p-hydroxystyrene, and using a sulfonyl diazomethane system acid generator like bis (cyclohexyl sulfonyl) diazomethane as an acid generator as base material resin is known, for example (JP,5-249682,A).

[Procedure amendment 2]

[Document to be Amended] Specification

[Item(s) to be Amended] 0006

[Method of Amendment] Modification

[Proposed Amendment]

[0006] In order to conquer such a fault, in addition to an acetal radical, the mixed resin containing the copolymer which

made the acid dissociation nature machine which cannot dissociate easily in weak acid like a tert-butoxycarbonyl radical, tert-butyl, and a tetrahydropyranyl group, and is dissociated with strong acid live together, or it, and the chemistry magnification mold positive-resist constituent using a sulfonyl diazomethane system acid generator are proposed, and this is in use current.

[Translation done.]